Is High Modified Mallampati Score A Risk Factor for Arterial Hypertension?

Yüksek Modifiye Mallampati Skoru Arteriyel Hipertansiyon için Risk Faktörü Müdür?

Modifiye Mallampati Skoru ve Arteriyel Hipertansiyon / Modified Mallampati Score and Arterial Hypertension

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Özet

Amaç: Yapılan araştırmalarda üst hava yolu anatomik darlıkları, insulin rezistansı, aterosklerozis, obezite gibi durumlar HT için risk faktörü olarak tanımlanmışlardır. Bu çalışmanın amacı, orofarenks düzeyinde üst hava yolu darlığının bir göstergesi olan Modifiye Mallampati Skoru ile Hipertansiyon arasındaki ilişkiyi değerlendirmektir. Gereç ve Yöntem: Çalışmaya 57 kadın (41.3%) ve 81 erkek (58.7%) olmak üzere toplam 138 erişkin dahil edilmiştir. Hastalar kardiyoloji kliniğine çeşitli sebeplerle gelen, öykülerinde hipertansiyon geçmişi bulunan, herhangi bir başka bilinen sistemik hastalığı olmayan, herhangi bir sebeple ilaç kullanmayan ve detaylı Kulak Burun Boğaz muayenesinde havayolu obstrüksiyonu yapacak anatomik bozukluğu olmayan hastalar arasından seçilmişlerdir. Bulgular: Hastalar MMS'e göre, sırasıyla sistolik ve diyastolik arteriyel kan basıncı ortalama değerleri ile sınıflandırıldığında HT ile MMS arasında istatistiksel bir ilişki olduğu görüldü. MMS1-MMS2, MMS1-MMS3 grupları arasındaki sistolik ve diyastolik kan basınçları ile MMS2-MMS3 grupları arasında diyastolik kan basınçlarda istatistiksel anlamlı ilişkiler olduğu tespit edildi. Böylece MMS artışı ile sistolik ve diyastolik kan basındaki artışların korele olduğu izlendi. Tartışma: Yüksek MMS skorları ile HT'nun ilişkili olduğu izlendi. Klinisyenler tarafından yüksek mallampati skoruna sahip hastaların HT yönünden değerlendirilmeleri gerektiği düşünülmüştür.

Anahtar Kelimeler

Modifiye Mallampati Skoru; Hava Yolu Darlığı; Hipertansiyon

Abstract

Aim: Various studies have shown that one of these predisposing risk factors, namely the anatomical narrowness of the upper airway, is linked to insulin resistance, atherosclerosis, obesity, and HT related diseases. This study investigates the possible relation between HT and the Modified Mallampati Score (MMS) which is linked to the anatomical narrowness of the upper airway at the oropharynx level. Material and Method: The study covers a total of 138 adults of which 57 are women (41.3%) and 81 are men (58.7%). The patients were selected among those adults who had presented to the cardiology clinic with a known history of hypertension, without any systemic diseases, not on medication for any reason, and without any anatomical problems that could give way to airway obstruction through a detailed ENT examination. Results: According to MMS the mean figures of systolic and diastolic blood there was a statistically significant relation between HT and MMS ($p<0.05$). There was also a statistically significant difference between the systolic and diastolic blood pressures of patients with MMS1-MMS2, MMS1-MMS3. The same relation was found between MMS2-MMS3 only regarding the diastolic pressures ($p<0.017$). Discussion: It is shown that high MMS is related to HT. We think that it would be best for high MMS patients be evaluated concerning HT during the initial examination of the patient by the clinician.

Keywords

Modified Mallampati Score; Airway Obstruction; Hypertension

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Introduction

Respiratory sleep disorders are associated with upper airway obstruction as described in 1973 by Cristian Guilleminault [1]. Obstructive sleep apnea (OSA) is a frequently seen disease in a society and studies show that it affects more than 30% of the population [2]. Risk factors for OSA and snoring are seen in patients between 40 and 65 years -mostly males- and in those who are obese, smokers, drinkers and lead a sedentary life [3]. OSA was associated with numerous diseases, such as coronary disease, stroke, dyslipidemia and diabetes mellitus [4]. The main physical findings include an enlargement of the neck circumference, oropharyngeal obstruction, soft palate laxity, nasal obstruction, turbinate hypertrophy, nasal septum deformity, nasal cavity tumors, tonsil hypertrophy, macroglossy, retrognatia, and temporomandibular deformities [5].

Hypertension (HT) or high blood pressure, is a cardiac chronic medical condition in which the systemic arterial blood pressure is elevated [6]. Persistent hypertension is one of the risk factors for stroke, myocardial infarction, heart failure and arterial aneurysm, and is a leading cause of chronic kidney failure [7]. Moderate elevation of arterial blood pressure leads to shortened life expectancy. Dietary and lifestyle changes can improve blood pressure control and decrease the risk of associated health complications, although drug treatment may prove necessary in patients for whom lifestyle changes prove ineffective or insufficient [8].

In 2000 it is estimated that nearly one billion people or ~26% of the adult population have hypertension worldwide [9]. It was common in both developed (333 million) and undeveloped (639 million) countries.[11] However, rates vary markedly in different regions with rates as low as between 3.4%-68.9% (men) and 6.8%-72.5% (women) [10].

Many recent studies have shown the relation between OSA with upper airway obstruction and peripheral arterial hypertension [4,11,12,13,14]. Further, the most recent studies have put forward that moderate, even mild OSA increases the risk of developing systemic hypertension [4].

Modified Mallampati Score (MMS) is a parameter that is commonly being used in the physical examination phase before surgery and it enables the anesthesiologist to get an understanding of how difficult the intubation might be by showing the level of upper airway obstruction [15]. The studies displaying the relation between the MMS and OSA have been published especially in recent years [16].

This information led us to ponder if there was a relation between MMS and HT. We wanted to evaluate the relation between HT and MMS, which is one of the morphologic parameters that show us the resistance in the upper airway, in order to display this possible relation.

We think that knowing such a relation beforehand prevents, or at least to postpones, the development of HT through the follow-up and treatment of those patients under the risk of hypertension. Moreover, knowing those patients under the risk of HT will decrease possible vital risks through taking the necessary measures by both the patient and the physician in cases (heavy exercise, surgeries of the vascular system and drug therapies affecting this system) where the cardiovascular burden is heightened, where hypertension and its complications strokes [17], myocardial infarction [17], heart failure [18], left ventricular hypertrophy [19], hypertensive retinopathy, hypertensive nephropathy [20] are likely to occur.

Material and Method

The study was initiated with the permission of Ufuk University's Ethical Board for Clinical Trials dated May 28, 2009 with the number 08048. The patients who had first presented to the cardiology outpatient clinic for any reason were included in the study.

All the patients were examined by an attending cardiologist at the cardiology outpatient clinic and their routine tests (full blood, blood lipid profile, fasting blood glucose, thyroid function tests, and electrocardiogram) were completed. Among these patients those who had no systemic diseases (Chronic Obstructive Pulmonary Disease, Diabetes Mellitus, Kidney, Liver disease etc.), those with no history of cardiovascular or respiratory system surgery of diseases, those who were not currently using drugs with systemic effects, and those who were not morbidly obese (BMI <40) were sent to the ear, nose, and throat specialist. The ENT specialist conducted a second elimination through routine ENT examination, diagnostic nasal endoscopy, and endoscopic laryngoscopic examinations. Within this elimination the patients who remained outside the exclusion criteria such as craniofacial abnormalities, cranio-dysostosis, craniostenosis and meningomyelocele, nasal obstruction due to polyposis, nasal tumors, advanced nasal septal deviation, inferior nasal turbinate hypertrophy.

The patients have been examined by the ENT and cardiology specialist in the following manner:

The Evaluation of Modified Mallampati Score (MMS):

MMS is evaluated when the patient is upright and facing forward, according to the visual level of soft palate and tonsil plicas based on the size of the tongue and the area it covers while the tongue is in the mouth. MMS is a parameter that is commonly being used in the physical examination phase before surgery and it enables the anesthesiologist to get an understanding of how difficult the intubation might be by showing the level of upper airway obstruction [15].

The MMS has been calculated in the way Friedman et al. had suggested [21].

Blood Pressure Measurements:

Blood pressure measurements were performed in a quiet room with an appropriately sized cuff encircling the arm (covering two-thirds of the length of the arm) after sitting quietly with the back supported for five minutes and arm supported at heart level. No caffeine for the preceding hour and no cigarettes for the preceding 15 minutes were allowed. No exogenous adrenergic stimulants (e.g. nasal decongestants containing phenylephrine) were allowed on the day of measurement. Aneroid gauges that were calibrated against a mercury manometer were used in all measurements.

In each blood pressure assessment, 2 readings were taken. If readings varied by more than 5 mmHg, additional readings were taken until two were close. For the diagnosis of hypertension, three sets of readings were obtained a week apart. At the initial assessment, pressure was taken in both arms, and if pressure differed, the subsequent readings were taken from the arm with higher pressure.

During the measurements, bladder was quickly inflated to a pressure 20 mmHg above the systolic, as recognized by disappearance of the radial pulse. Then, the bladder was deflated 3 mmHg every second. Korotkoff phase I was taken as the systolic blood pressure and Korotkoff phase V (disappearance) was taken

as the diastolic blood pressure. If the mean figure for the three blood pressure measurements was 140/90 mmHg or above, the patient was diagnosed with hypertension [22].

Statistical Study

The relations among independent groups were evaluated with the Chi-square test. In order to show the relations among related groups we used the Mann Whitney Test, whereas we used the Kruskal Wallis Test to account for the differences among the groups. Sperman's rho test was used in order to detect whether there was a correlation among the independent variables. When we needed binary comparisons among the groups this was done through Bonferroni correction. All the statistical data were analyzed by SPSS-18.

Result

The study covers 57 female (41.3%) and 81 male (58.7%) adult patients, totaling up to 138 patients aged between 20 and 72, with an average age of 48 ±10.47. Our results revealed that 71 patients (51.4%) were seen to have MMS 1, while 49 patients (35.6%) had MMS 2, 18 patients (13%) had MMS 3, and 1 case had MMS 4. Since there was a single case of MMS 4 it was excluded from the statistical study.

While 56 (40.6%) of the cases had HT, 82 of them (59.4%) had none. The mean arterial tension figures were seen to be 129.40± 15.91 mm Hg for the systolic while it was 87.36± 12.17 mm Hg for the diastolic pressure. The patients' mean systolic and diastolic blood pressure values were respectively: MMS 1 (123.96 ± 13.90), (79.71± 7.04); MMS 2 (132.92 ±14.87), (93.02± 10.36); MMS 3 (141.29± 17.66), (102.12± 10.93).

Whether there was a relation between difference in sex and the existence of HT and MMS was evaluated by the Chi-square test and no statistically significant relation was seen between them (p>0.05). There was, however, a statistically significant relation between HT and MMS (p<0.05).

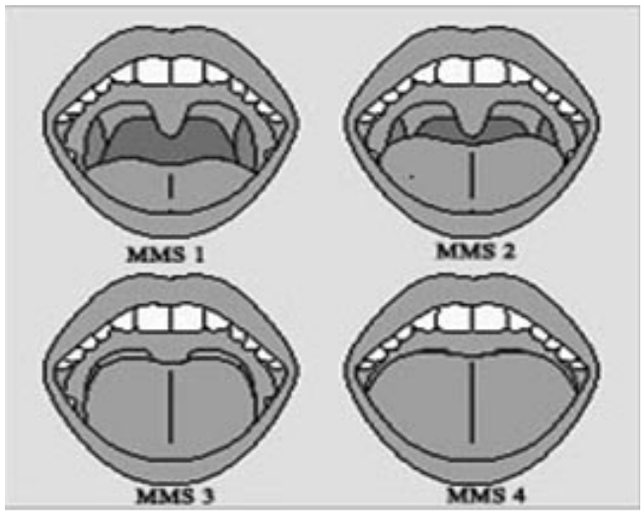
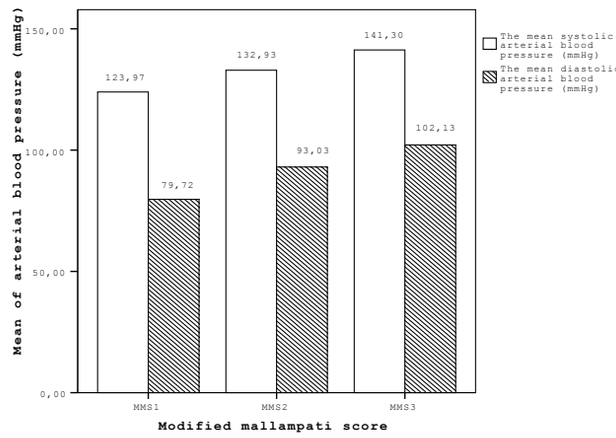


Figure 1. Modified mallampati score (Based on the article by Friedman et al. and modified) [24]. MMS 1: Soft palate, uvula and palatine tonsil plicas are clearly seen. MMS 2: The upper pole of the soft palate, uvula and palatine tonsils is seen. MMS 3: The uvula base and only a part of the soft palate are seen while the palatine tonsils are invisible. MMS 4: Only the hard palate is seen while the soft palate is not visible.



Graphic 1. Mean values of systolic and diastolic blood pressure levels according the differing MMS.

The relation between the patients' ages and HT was evaluated through the Mann Whitney test and a statistically significant relation was found between them (p<0.05). The relation between aging and rise in hypertension was evaluated by Sperman's rho test and a positively moderate relation was found. The level of relation was found to be 44% and 45% respectively for systolic and diastolic tension.

According to the Kruskal Wallis test and different MMS, there were differences in age, systolic and diastolic blood pressures (p<0.05). Bonferroni correction was performed for the binary comparisons among the groups regarding aging, MMS, systolic and diastolic blood pressure levels and the p value was set at 0.017. Changes in systolic and diastolic blood pressure levels according to the differing MMS are shown in Graphic 1.

It was seen that there was a statistically meaningful difference between the systolic and diastolic blood pressure levels of patients with MMS 1-MMS 2, MMS 1-MMS 3 (p<0.017), showing that the more MMS rises the more blood pressure of the patients increase. The same relation was found between MMS 2-3 only within the diastolic pressure levels (p<0.017). The existence of hypertension according to the MMS scores are shown in Table 1.

Discussion

The upper airway is the leading anatomical area in the OSA physiopathogenesis. Findings such as retrognathia, hypertrophic tonsils, macroglossia, elongated uvula are important parameters that show the ENT specialist that the patient is under the risk of OSA during the physical examination of these patients [9].

High MMS (Stage 3-4), detected through a simple oropharenx examination and pointing out to a narrowness in the upper air-

Table 1. The number and percent score values of patients with and without hypertension according to the mallampati scores.

UNION OF MODIFIED MALLAMPATI SCORE AND HYPERTENSION			MALLAMPATI SCORES			TOTAL
			MMS1	MMS2	MMS3	
HYPERTENSION	No	Number of Patients	55	22	5	82
		%	67,1%	26,8%	6,1%	100,0%
	Yes	Number of Patients	16	27	13	56
		%	28,6%	48,2%	23,2%	100,0%
TOTAL		Number of Patients	71	49	18	138
		%	51,4%	35,5%	13,0%	100,0%

way, has been found to be associated with OSA in recent studies. Especially people with advanced (3-4) MMS are shown to have more frequent OSA occurrences [23].

Previous studies put forward that upper airway obstruction has negative effects on the cardiovascular system like heart rate and blood pressure [24]. Epidemiological studies also show that there is a strong relation between the Apnea Hypopnea Index (AHI) and systemic hypertension, and that increases in AHI also increase the risk of systemic hypertension [11]. What is more important; prognostic studies have proved that this relation increases independent of other hypertension risk factors [25].

In our study 56 of the cases had HT (40.6%) while 82 of them had none (59.4%). This result is in accordance with the recent prevalence values in developing countries [10].

The mean age of the individuals in the study was 48 ±10.47, while their gender distribution was 57 female (41.3%) and 81 male (58.7%). These results show us that the study group is balanced regarding gender in the middle-age group.

The mean systolic and diastolic blood pressure values were found to be 129.40± 15.91 and 87.36± 12.17 mmHg respectively. This result indicates that in our patient group the mean blood pressure values are on the verge of prehypertension in line with our study group's mean age value of 48 ±10.47 [26]. This result shows no relation between gender difference and HT for patients of this age group presenting to the cardiology clinic. These results are in line with extensive studies [27].

It was also seen that the more the patient's age got higher the more HT frequency got with the increase in diastolic and systolic blood pressures and this was in line with other studies [28].

According to the MMS, the mean systolic and diastolic blood pressure levels of the patients were found to be: MMS 1 (123.96 ± 13.90); (79.71± 7.04), MMS 2 (132.92 ±14.87); (93.02± 10.36), MMS 3 (141.29± 17.66); (102.12± 10.93) mmHg. The more the MMS gets higher, the higher the patients' systolic and diastolic blood pressure values and HT occurrence frequency get.

It is known that the autonomous neural system plays a critical role in the formation of cardiovascular changes brought about by the obstruction of air flow during respiration [29].

Various studies have argued that the relation between the airway obstruction and hypertension is basically related to the activation in the sympathetic neural system. According to this theory, hypoxia as a result of airway obstruction may increase the sympathetic neural activity (SNA) through the carotid body and causes vasoconstriction in the peripheral blood vessels [29]. According to another view, also hypercapnia, brought about by airway obstruction and adiaphoresis, directly increases sympathetic neuronal activity [29]. On the other hand, there are other authors who argue that events in the respiratory system that occur during the respiratory disorder also give way to a direct increase in the SNA concerning peripheral blood vessels and the heart [30].

Consequently, many researchers have concluded that chronic airway obstruction may lead to HT by forming permanent changes in the SNA regardless of its mechanism [4, 11, 12, 13, 14].

Today arterial hypertension is regarded as a disease that affects a great deal of the population, causes serious morbidities, and needs large amounts of money for its treatment.

The fact that MMS is a parameter that can be easily detected through a simple examination makes it more valuable.

Previous studies have shown that high MMS is an important isolated risk factor for the worsening of the apnea. In this study we have seen that MMS and HT are related to each other independent of other clinical and laboratory parameters.

The results of our study reveal that high MMS may very well be a premonitory parameter for hypertension. It is nonetheless clear that this conviction has to be supported by further extensive studies.

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